

Arup**Acoustics**

Gallagher Estates

Gavray Drive

Noise Assessment

Report ref

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Noise Assessment

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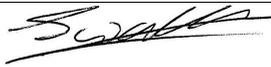
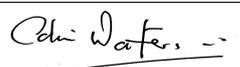
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EXECUTIVE SUMMARY

An assessment of environmental noise has been carried out for a proposed residential development site adjacent to Gavray Drive, Bicester.

A 24 hour noise survey was carried out to determine the PPG 24 noise exposure categories (NECs) for the site. The measured noise levels place part of the site into NEC A and part in B. That part of the site in NEC B (where PPG 24 recommends that 'Noise should be taken into account when determining planning applications.') is that closest to the principal noise sources, namely the A4421 and the London to Bicester railway line.

It is concluded that it will be necessary to incorporate suitable noise mitigation into residential development on parts of this site. Suggested options such as consideration of site layout, screening, property orientation and building design including glazing specification are discussed.

The assessment has also considered the potential impacts that this proposed development may have upon the local area and has assessed the effects of these impacts. The consideration has identified traffic noise impacts as likely to have a slight to moderate impact to dwellings to the SW of Gavray Drive. The absolute level of noise exposure of these dwellings is such that the overall effect of the increased noise exposure is considered to be minimal. All other noise sources both operational and constructional are not expected to have an adverse effect upon the local area.

1. INTRODUCTION

It is proposed that the site adjacent to Gavray Drive in Bicester be developed for residential use and for a rail link. Currently the site is grassland interspersed with hedgerows.

A noise survey was carried out to ascertain the existing noise levels from noise sources across the proposed development site. Noise was measured to establish whether the site was suitable on noise grounds for development as residential housing in terms of PPG24.

The noise issues that are likely to occur as a result of this development are discussed and are detailed later in this report and where necessary recommendations are made to mitigate measures to ameliorate any impact on local residents. A glossary of terms is included as Appendix B.

1.1 Site Description

The site to be developed is located between Gavray Drive in the south and the main London to Bicester railway line to the north.

Along the western edge of the site is a freight line which runs roughly north-east to south-west and is on the same level as the site. To the east of the site is the A4421 which does not appear to have any noise barriers on site side but does on its side.

The railway to the north is on an embankment approximately 10 m high. At the western end of the site the railway is visually screened by trees. There is a goods depot but any activity here was not audible from the site. There is relatively new housing development to the south of the site beyond Gavray Drive.

The area to be developed is generally flat but there are dry ditches running across it both east to west and north to south. These ditches are generally damp but do not have running water. There is a river up to 2 m wide running from north to south just inside the western half of the site.

Two footpaths cross the site, one from north to south at the western edge of the site and the other east to west across the south-eastern corner of the site.

The land is occupied by grassland divided up by mature hedges. The western third is, on the whole amenity length, the remaining two thirds is generally very tall 1-1.5 m high with criss-crossing pathways.

Traffic on the A4421 was relatively heavy throughout the day but very light during the night. Gavray Drive was never particularly busy as it only provided access to the western end of the new housing development to the south.

Rail traffic on the London to Bicester Line generally consisted of two to three carriage diesel driven passenger trains. Freight traffic on the north to south line was not frequent though that which was observed consisted of 50+ aggregate trucks driven by a large diesel locomotive.

There was distant road traffic noise from the A41 which was particularly noticeable during the night when other more local noise sources were relatively quiet.

1.2 Proposed Development

It is proposed that the development will consist of residential housing and recreational areas across the area. The far western end may contain a rail spur connecting the freight line with the London to Bicester line. The western portion of the site will contain a school with its associated grounds and a community facility.

This examination considers the development of the site in accordance with the development framework plan of 20 October 2004. This plan assumes residential development on both the east and west sections of the site.

2. NOISE CRITERIA

PPG 24 [1] offers guidance on noise when considering the suitability of a site for residential development near to new or existing noise sources. It also defines noise exposure categories (NECs) for day and night-time to assist in assessing whether or not it is appropriate to permit the development of residential properties for a given noise climate. The categories relate to different noise bands depending on the source of noise, i.e. road, rail, air, or mixed noise sources. For this assessment daytime and night road traffic noise was considered to be dominant across most of the site, for the remainder a combination of road and rail noise dominated. The noise exposure category boundaries for road traffic and mixed sources are the same (Table 1).

The noise exposure categories given in PPG 24 for road traffic and mixed sources are reproduced below in Table 1. The associated advice provided in PPG 24 relating to the granting of planning permission for residential use is reproduced in Table 2.

Noise Levels ⁰ Corresponding to the Noise Exposure Categories for new dwellings				
L _{Aeq,T} dB				
Noise Exposure Category				
Noise source	A	B	C	D
Road Traffic				
07:00-23:00	<55	55-63	63-72	>72
23:00-07:00 ¹	<45	45-57	57-66	>66
Mixed Sources ²				
07:00-23:00	<55	55-63	63-72	>72
23:00-07:00 ¹	<45	45-57	57-66	>66

Table 1: Noise exposure categories for new dwellings near road traffic noise sources

Notes: ⁰ Noise Levels: the noise level (s) (L_{Aeq,T}) used when deciding the NEC of a site should be representative of typical conditions.

¹ Night time noise levels (23:00-07:00): sites where individual noise events regularly exceed 82 dB L_{Amax} (S time weighting) several times in any hour should be treated as being in NEC C, regardless of the L_{Aeq,8hr} (except where the L_{Aeq,8hr} already puts the site in NEC D).

² Mixed Sources: This refers to any combination of road, rail, air and industrial noise sources. The “mixed source” values are based on the lowest numerical values of the single source limits in the table. The “mixed source” should only be used where no individual noise source is dominant.

NEC A	Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as a desirable level.
NEC B	Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection against noise.
NEC C	Planning permission should not normally be granted. Where it is considered that permission should be given, for example because there are no alternative quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise.
NEC D	Planning permission should normally be refused

Table 2: Definitions of noise exposure categories for new dwellings near existing noise sources

3. NOISE ASSESSMENT METHODOLOGY

Measurements were conducted to provide suitable data to quantify the noise climate around the area to be developed to provide a baseline noise level for the area. The assessment was carried out in accordance with PPG24. As a proportion of the noise across this site was expected to be from rail a 24-hour noise survey was required. The measurement locations were chosen to give an indication of road and rail noise across the site, in particular the area close to the A4421 and main passenger railway line. L_{Aeq} 16-hour daytime and 8-hour night time measurements are the required measure for assessment of mixed road and rail noise.

Daytime is considered to be from 07:00-23:00.

Night-time is considered to be 23:00-07:00.

This information was used to assess the suitability of the site for development as residential properties.

3.1 Measurement Survey

The noise measurement survey was carried out by Arup Acoustics' engineers Jamie Walker and Julien Francois over a period from 12:00 on Tuesday 29 July 2004 to 12:00 on Wednesday 30 July 2004. Measurements were taken at locations 1 to 4 in rotation over each hour. A logging meter was set up at location 5 to log data every 5 minutes for the 24-hour period.

For each noise measurement, the sound level meter used, noise climate, wind speed and direction, and the precise measured noise levels were noted. L_{A10} , L_{A90} , L_{Aeq} and L_{Amax} , noise indices were recorded as was traffic counts on adjacent roads where necessary. The results are reported in Appendix A.

3.2 Measurement Procedure

The sound level meter (SLM) was mounted on a tripod, with the microphone set approximately 1.2-1.5 m above ground level. A windshield was fitted to the microphone to minimise the effects of wind-induced noise across the microphone diaphragm.

All measurements were taken in an acoustically 'Free Field' condition, at least 3.5 m away from any vertical reflective surfaces. The measurement locations were chosen to provide a

representative indication of the typical ambient noise level across the area proposed for redevelopment as residential housing and school.

The weather conditions during the survey were generally dry and cloudy with wind between 0 and 3.8 m/s there was a short shower between 02:00 and 02:30 though roads seemed to dry fairly quickly. At the time of any measurement the conditions were within acceptable limits with the wind speed being less than 5 ms⁻¹.

The instrumentation used to carry out the noise survey was as follows:

Brüel & Kjær 2260 class 1 precision sound level meter (SLM) 2 off

Brüel & Kjær Type 4231 Calibrator

Kestrel 1000 Anemometer

Compass

Immediately before and after each series of measurements was carried out, the SLMs' calibration was checked using the SPL calibrator. Wind speed was monitored throughout the measurement period and was found to be within acceptable limits (i.e. < 5 m/s).

All noise measuring instrumentation owned and used by Arup Acoustics is checked for calibration to traceable national and international standards on an annual basis. Routine 'in-house' spot checks are also carried out at regular intervals as part of Arup Acoustics' QA policy.

4. MEASUREMENT LOCATION DESCRIPTIONS

Noise measurements were taken at five locations during the survey period and these are shown in Figure 1 and detailed below.

4.1.1 Location 1- North-east corner of the site

The SLM was sited 3 m to the north of a virtually dry pond and 12 m west of the hedge which runs along the east side of the field. The field is covered with long grass and surrounded on all sides by hedges. Gavray Drive was 260 m away to the south-west, the A4421 was 140 m to the east and the London to Bicester railway line was approximately 100 m to the north-east.

During the daytime the A4421 dominated with some very intermittent noise from Gavray Drive. Cars on Gavray Drive were only just audible though larger vehicles were noticeable. When the A4421 and Gavray Drive were quiet distant road noise from the A41 in the west-south-west was audible. There was some, sporadic noise from children playing around lunch time. Birdsong was particularly significant just before sunset and in the morning. There were occasional trains throughout the day though those in the evening, when other noise sources were quiet, were more noticeable. There were occasional aircraft over head and some noise from the wind in the trees. There was no noise from the depot on the north side of the railway line.

During the night-time noise from the A41 was almost constantly heard with intermittent noise from the A4421, a number of HGVs passed which were particularly noisy. Noise from Gavray Drive was also present but very intermittent. The A4421 got louder before the A41.

4.1.2 Location 2- South-east corner of the site

The SLM was sited 7 m north-west of the corner of the field and had hedges 5 m away to the south-east and south-west. To the north-west, north and north-east was an open field covered in long grass. Location 1 was approximately 120 m to the north-east with the railway 100 m further away in the same direction. Gavray Drive was approximately 150 m away to the south-west and the A4421 was approximately 120 m away to the east.

The daytime noise climate was dominated by the A4421 together with the A41 audible during quiet periods. Very infrequent traffic on Gavray Drive was audible including one or two vans and HGVs. Trains were audible though not visible and not frequent. There were a number of aircraft overhead during the day including a loud flypast by a helicopter. There was occasional low noise from Bicester town centre and from the wind in the trees. Birds also had some local input though this varied greatly throughout the day.

The night-time noise was dominated by intermittent traffic on the A4421 including HGVs and fairly constant noise from the A41, the roads were quietest between 02:00 and 05:00. At around 04:00 just as it started to get light, noise from bird song was as significant as road noise from all sources. Trains in the early hours (02:00) of the day and up until midnight were heard, though not throughout the rest of the night.

4.1.3 Location 3- On the footpath between Gavray Drive and Peregrine Way

The measurement location was on the east side of the path adjacent to the rear façade of the closest house on Merganser Drive. Gavray Drive was approximately 30 m away to the north-east and visible at the end of the footpath. The A4421 was approximately 130 m away to the south-east and screened by hedges and two storey residential buildings. The edge of the proposed development was approximately 50 m to the north east.

The daytime noise climate was dominated by the A4421 together with the intermittent traffic on Gavray Drive. The A41 was audible when other noise sources were quiet. Noise from people on the footpath was loud but brief. Lawn mowing and gardening 20-30 m away as well as people in their gardens were heard throughout the daytime measurements though, except for the lawn mower, these events were relatively quiet. Occasional bird song and aircraft overhead also had some input though neither was significant during the day.

The night-time measurements were dominated by the A4421 and the A41 with intermittent input from Gavray Drive. A very small number of trains were heard, although from this location these were very quiet. Bird song was significant during the early hours reaching a peak around 04:00, although bird song was the loudest noise at this time it was still intermittent.

4.1.4 Location 4- On the footpath at the western end of the site

The measurement location was at the northern end of the field 15 m south of where the footpath crossed the line of the north to south hedge. The London to Bicester railway was 60m away to the north-east and the freight railway was 60 m to the north-west. Approximately 90 m to the north was the London to Bicester railway bridge over the freight railway. The footpath continued to the north under this same bridge. Gavray Drive was approximately 150 m away to the south-west and hidden from view by the hedge along the southern edge of the field. The London to Bicester railway was on an approximately 10 m high embankment and trains on it were visible for some distance in both directions.

Day time noise was from a large number of intermittent sources. Trains on the London to Bicester line were frequent and often blew their horns before crossing the bridge over the Freight line and a noise like trains shunting was heard at various times to the west. Traffic on the A41 provided a fairly constant background noise which was audible when other sources were quiet, the same was true of the A4421 though this was more intermittent noise. Bird song was fairly loud at times but not constant. The wind through the trees was audible when the wind was strongest. Some noise sounding like an industrial fan was heard to the west though as this was relatively quiet it was mainly heard when other noise sources were quiet. There were a number of aircraft overhead including two helicopters which were particularly loud though only briefly in the area. In the evening children camping in a field adjacent to the measurement location meant that it was necessary to move the measurement location 100 m

along the footpath to the south-west. This noise continued throughout the whole evening and night.

Night-time noise also had no single dominant source except that the noise from the A41 was the most consistent. Intermittent traffic on the A4421 could be heard faintly, traffic on Gavray drive was also heard though this was even more infrequent. Birdsong at first light was particularly noisy though only after 03:30. A single freight train on the north to south railway line was heard; this was a large train with 50+ aggregate trucks.

4.1.5 Location 5- The Logging meter

The logging meter was placed 10 m east of a hedge 160 m north-east of Gavray Drive. The SLM was on the edge of a large field with a hedge approximately 35 m to the north-east. The London to Bicester railway was approximately 180 m to the north-east and was almost completely obscured by trees along its edge. Location 1 was 200 m away to the east but obscured by a large mature hedge.

5. ASSESSMENT IN ACCORDENCE WITH PPG24

The measured noise levels were taken as a base to construct the boundaries to the NEC areas

The NEC zones referred to below are shown as Figures 7 and 8.

The daytime situation shows that the majority of the site falls within NEC A with two narrow strips parallel to the east and west boundaries of the site. This is shown as Figure 7.

Figure 8 illustrates the night time situation which again shows the majority of the site within NEC A. However, the NEC B zone is significantly increased and would occupy approximately 50% of the area of the development on the eastern half of the site.

For NEC A, PPG24 states '*Noise need not be considered as a determining factor when granting planning permission, although the noise level at the high end of the category should not be considered as a desirable level.*'

For NEC B PPG24 states that '*Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection against noise.*'

Schools and community facilities can be considered to be, in part at least, noise sensitive. However, the NEC categories are not directly relevant to the classification of the suitability of the site for such developments. The position of the school and community facility in the proposed masterplan is such that they would be well within NEC zone A. In these circumstances the expected noise exposure of the school buildings would be around 50 dB L_{Aeq} over the school day. The school would not need to have any special glazing applied to give satisfactory interior noise levels. However, some attention may be necessary to the means of ventilation and some form of passive ventilation may be required. This feature would be considered at the detail design stage.

6. RAILWAY NOISE

There is a possibility that the area of land at the western end of the site adjacent to the Bletchley Oxford railway will be developed to provide a link from this line to the Bicester Oxford Line. The land is reserved for this development but there is no certainty that this 'Bicester Chord' will be built. A study of the noise effects of the establishment of this link has been carried out by Scott Wilson and reported in their document A011170 (7 May 2004).

When considering the likely noise in the planning context of the development of this rail link Scott Wilson concluded that the 'with scheme' noise levels over the L_{Aeq} , 8hr period were

generally below 45 dB and that the area falls generally within the NEC A zone. Except for a very narrow strip of land adjacent to the railway link. It was similarly shown that the L_{Aeq} 16 hr was below 55 dB except for a similar narrow strip of land next to the chord. Scott Wilson examined the potential use of mitigation of this noise by a 2.4m noise barrier alongside the line at the base of the embankment but concluded that the improvement achieved was not sufficient to warrant the cost involved.

The masterplan document reserves an area of land adjacent to the line of the potential chord and this is sufficient to ensure that the land to be used for residential development is not compromised by the greater than NEC A zone indicated in the Scott Wilson report.

7. RECOMMENDATIONS

Much of the site falls into NEC A which as stated above should require no special measures to allow planning permission for residential development to be granted. If it is proposed that dwellings or noise sensitive receptors be built in NEC B some of the noise mitigation measures suggested below may be required to provide acceptable noise conditions. These would need to ensure a commensurate level of protection against noise for dwellings and their grounds and/or garden in the part of the site that falls into NEC B. Suggested options are listed below.

7.1 Site Layout

A development of this size has a number of uses associated with the residential development that are not of themselves sensitive to noise. This is especially the case when the noise exposure is more significant at night. The opportunity should be taken to place these land uses within zone B.

7.2 Screening

The main sources of noise affecting this site are the A4421 and the London to Bicester railway to the east and north of the site respectively. Well designed screening along the eastern boundary in particular and possibly along the northern would mitigate road traffic and rail noise. The screening may need to provide screening to all floors of any proposed residential dwelling such that there was no line of sight between any noise sensitive windows and the far side of the A4421. Once the layout of the proposed development site is finalised a detailed assessment is recommended to ascertain whether any screening would provide adequate mitigation to reduce noise levels on site. As the London to Bicester railway line is on an embankment the barrier would need to be significantly higher than if the railway was at the same level as the site to be developed.

7.3 Property Orientation

The careful orientation of residential properties could be used to ensure that sensitive habitable rooms, such as bedrooms and living rooms do not directly overlook the A4421 and London to Bicester railway. Where possible, lobby areas, kitchens, stairways, toilets and utility rooms should be used as buffer zones within the property.

7.4 Building Design

The PPG 24 recommendations for noise control for residential development in NEC B are for 'an adequate level of protection against noise'. BS 8233:1999 'Sound insulation and

reduction for buildings' [2] contains recommended internal noise levels for bedrooms ($L_{Aeq T} = 30$ to 35 dB) and living areas ($L_{Aeq T} = 30$ to 40 dB).

The above internal noise levels could be achieved by a combination of some of the factors listed above together with a good standard of acoustic double glazing. For example a façade containing only closed standard thermal glazed windows with a specification of 10/12/6 mm, fitted with good seals would offer at least a 35-40 dB attenuation of the noise from the outside to the inside. However, adequate ventilation would be required when the windows are closed. To ensure that there is no reduction of the sound insulation performance whilst providing ventilation, it is recommended that acoustically lined trickle vents are fitted to the windows or an acoustic air brick installed. To maintain the acoustic integrity of the façade of these dwellings it is recommended that the doors are not glazed but made from solid hardwood closing onto resilient seals.

Façade and glazing mitigation alone would not provide any mitigation to the gardens and/or grounds of the proposed dwelling. The planning authority may therefore wish to see other mitigation employed to protect this amenity. The provision of 2 m high close boarded fences to the gardens is usually sufficient to achieve satisfactory noise conditions in these areas.

7.5 School

As set out in section 5 above some consideration will need to be made of the school ventilation measures at the appropriate design stage.

8. ASSESSMENT OF SITE SUITABILITY

An assessment of environmental noise has been carried out for the proposed residential and associated community facilities development adjacent to Gavray Drive.

Consideration of measured noise levels have been made with the guidance contained in Planning Policy Guidance, PPG 24 "Planning and Noise".

The measured noise levels place the site partly into NEC A, partly into NEC B.

It will be advisable that some noise mitigation be incorporated into properties in NEC B for this development to proceed. No noise mitigation will be required for properties in NEC A. The noise mitigation in NEC B would need to ensure a commensurate level of protection against noise for the dwellings and their grounds and/or garden. Suggested options include consideration of site layout, screening, property orientation and building design including glazing specification.

9. CONSIDERATION OF POTENTIAL NOISE IMPACT OF SITE ON THE LOCAL AREA

Based on the proposal plans the following potential noise changes have been identified:

- construction of the proposed development and infrastructure;
- road traffic noise from any changes in traffic flow or composition on existing roads;
- plant machinery noise associated with buildings.

These sources are now examined in turn and the potential effects classified where appropriate.

10. CONSTRUCTION NOISE

The most significant civil engineering work on this site will be that associated with the provision of the internal estate roads and the building of the new school. There will be some groundwork required with regard to local levelling but large scale earthworks are not envisaged. At this stage of the process, details are not available as to the type of plant that would be used, nor the timing or timescale of a particular activity. It is noted that Gavray Drive has been laid in such a way as to incorporate access points into the proposed development site and this will limit the amount of disruption of traffic on this road that may occur. It will also result in their being a separation of some 40-50 m from the facades of the nearest buildings to the on-site activity.

10.1 Control of Construction Noise

Notwithstanding the limited potential for adverse effects from construction activities, it remains relevant to consider the means whereby this source may be controlled. The Code of Practice BS 5228 sets out methods and procedures whereby construction noise may be minimised and would require that these methods are followed. The selection of the quietest machinery available to carry out any given task would, for example be an advantage if piling operations are to be carried out. Timing a particular on-site operation to coincide with the noisier ambient conditions, perhaps during peak traffic periods, would serve to limit the impact of that operation. The erection of a temporary noise screen would assist in some circumstances.

In order to ensure that the favourable circumstances of this development are maintained it is recommended that a Construction Schedule is drawn up with the contractor at the appropriate time and that this is agreed with the Local Authority. In this way the most appropriate mitigation measure can be specified if required and the overall residual noise from construction activity reduced to a level where it is not significant.

11. TRAFFIC NOISE IMPACT

The proposed development of this area of land for residential purposes will result in increased traffic flows along Gavray Drive and the Eastern Distributor Road around Bicester. In order to gauge the likely effect of these increases in noise terms an analysis has been carried out that examines the change in noise exposure that would result. Two scenarios have been compared. The 'do minimum' situation which would reflect the situation where no development takes place and the 'do something' situation which reflects the situation where the development is in place and fully operational.

11.1 Calculation of Road Traffic Noise

The level of noise that would result at a certain distance from a road depends upon the nature of the traffic in terms of its volume, speed and characteristics of the traffic mix; the physical nature of the road in terms of its gradient and surface; the distance from the road and the existence of any intervening barriers or absorbing surfaces. Road traffic noise levels can be calculated using the procedures of the *Calculation of Road Traffic Noise* CRTN. This method considers the parameters set out above and calculates the $L_{A10,18 \text{ hour}}$ level in dB. This index is prescribed for the calculation of traffic noise in the context of the Noise Insulation Regulations but has found relevance in all UK road noise assessment procedures.

For the situation being considered in this examination the only change that is being considered is the volume of road traffic along Gavray Drive and the eastern distributor road, traffic speed and mix being unlikely to change. All other factors and parameters remain unchanged. A

calculation has therefore been carried out that compares the *do minimum* situation with the *do something* situation.

The table below set out the traffic volumes for the *do minimum* situation and for the *do something* situation in terms of 18 hour AAWT. Also shown on the table are the changes in noise exposure that would result at a position adjacent to the road if this development were to be implemented. The tables are presented for the Phase 1 and Phase 2 schemes.

	2006 no dev. Do minimum 18 hour AAWT	2016 with dev Do something 18 hour AAWT	Increase factor	Change in noise level dB L _{A10, 18 hour}
Gavray Drive	1780	6125	3.4	+5
EDR	14963	20287	1.3	+1

Table 3.1 Change in noise level resulting from traffic change for the development scheme

11.2 Assessment of Traffic Noise

The following significance descriptors are proposed for traffic noise assessment. The threshold at which traffic noise change becomes significant is based on relevant research [Harland (1977)] and current guidance [Department of Transport (1994)]. For greater noise changes, increasing significance categories have been assigned at 5 dB(A) increments as changes of this magnitude are generally accepted as being noticeable by most people. This framework of significance levels, although not based on any official guidance document, is widely recognised and has been frequently adopted in traffic noise assessments.

- **major adverse:** Noise levels warrant mitigation of residential properties on a widespread basis in a community where practicable. This would relate to increases in noise level of 11-15 dB(A).
- **major beneficial:** Reduction of traffic noise to a level where it does not have a significant influence on the ambient noise in the area;
- **moderate adverse:** Noise levels warrant mitigation of residential properties in a community where practicable. This would relate to increases in noise level of 5-10 dB(A).
- **moderate beneficial:** Reductions in noise level of 5-10 dB(A) at residential communities;
- **slight adverse:** Increases in noise levels of 3-5 dB(A) in residential areas or at outdoor recreational areas in close proximity to the highway.
- **slight beneficial:** Reductions in noise level of 3-5 dB(A) at residential communities;
- **negligible:** Changes in noise level of less than 3 dB(A) in residential areas or at outdoor recreational areas in close proximity to the highway.

From Table 3.1 it can be seen that the increase in traffic noise will expose the dwellings adjacent to Gavray Drive to an increase that can be classified as on the boundary between a **slight adverse** effect and a **moderate adverse** effect. It would be expected that most of the exposed population would recognise that an increase of traffic noise had taken place.

Although traffic noise levels are forecast to increase with the scheme in place, it is considered that the noise levels would still be acceptably low. To put this into context, the forecast traffic noise levels would be well below guideline levels for outdoor living areas recommended by the World Health Organisation. Using this same criterion, traffic noise levels are not considered high enough to cause annoyance.

For the dwellings that are primarily exposed to the traffic noise from the eastern distributor road, the traffic noise increase would be considered to be **negligible**. The residents of these dwellings would not be expected to register the change in noise exposure.

11.3 Extent of Traffic Noise Increase

The traffic noise analysis set out above assumes that the increases in traffic volumes for the development are relevant for the whole length of Gavray Drive. Traffic figures are available only for the activity at the junction of Gavray Drive with the Eastern Distributor Road. This being the case the analysis is restricted to the area between the last exit onto Gavray Drive, from both the existing development and the proposed development, and the junction. However, in reality it can reasonably be assumed that the proportional change, and therefore the noise level increase, would be relevant to any position adjacent to this road.

12. INSTALLED PLANT NOISE

There is almost no likelihood that there will be any significant plant or machinery installed with the residential element of this development. The school building would almost certainly opt to install natural ventilation and the only plant would be that associated with heating. The school is some 70 m from the nearest existing dwelling and at this distance such plant would not have a significant effect. The proposed community facility would be expected to have some plant provided, such as a chiller or heating plant. To avoid any potential impact on the existing residential receptors on the adjacent area of Gavray Drive, any such plant should be specified such that the resulting noise level at the nearest noise sensitive receptor does not have a rating level that exceeds the existing background noise level. The same consideration should be given for the exposure of the school by the plant of the community facility.

13. OVERALL NOISE ASSESSMENT

13.1 Suitability of site for development

The studies set out above have shown that the site is suitable for residential development and that within the guidance offered in PPG 24 planning permission is unlikely to be withheld on noise grounds.

13.2 Potential impact on local area

The potential effect of the development on the local area is limited to an increase in road traffic noise that indicates a slight to moderate effect at the dwellings adjacent to Gavray Drive. It is however considered that this change, although probably noticeable would not significantly prejudice the satisfactory traffic noise conditions in this area. °

REFERENCES

- [1] Department of the Environment (1994), *Planning Policy Guidance 24*, Department of the Environment.
- [2] British Standards Institution (1999) BS 8233 *British Standard code of practice for sound insulation and noise reduction for buildings*, British Standards Institution.
- [3] World Health Organisation (1999), *Guidelines for Community Noise*, World Health Organization.

FIGURES

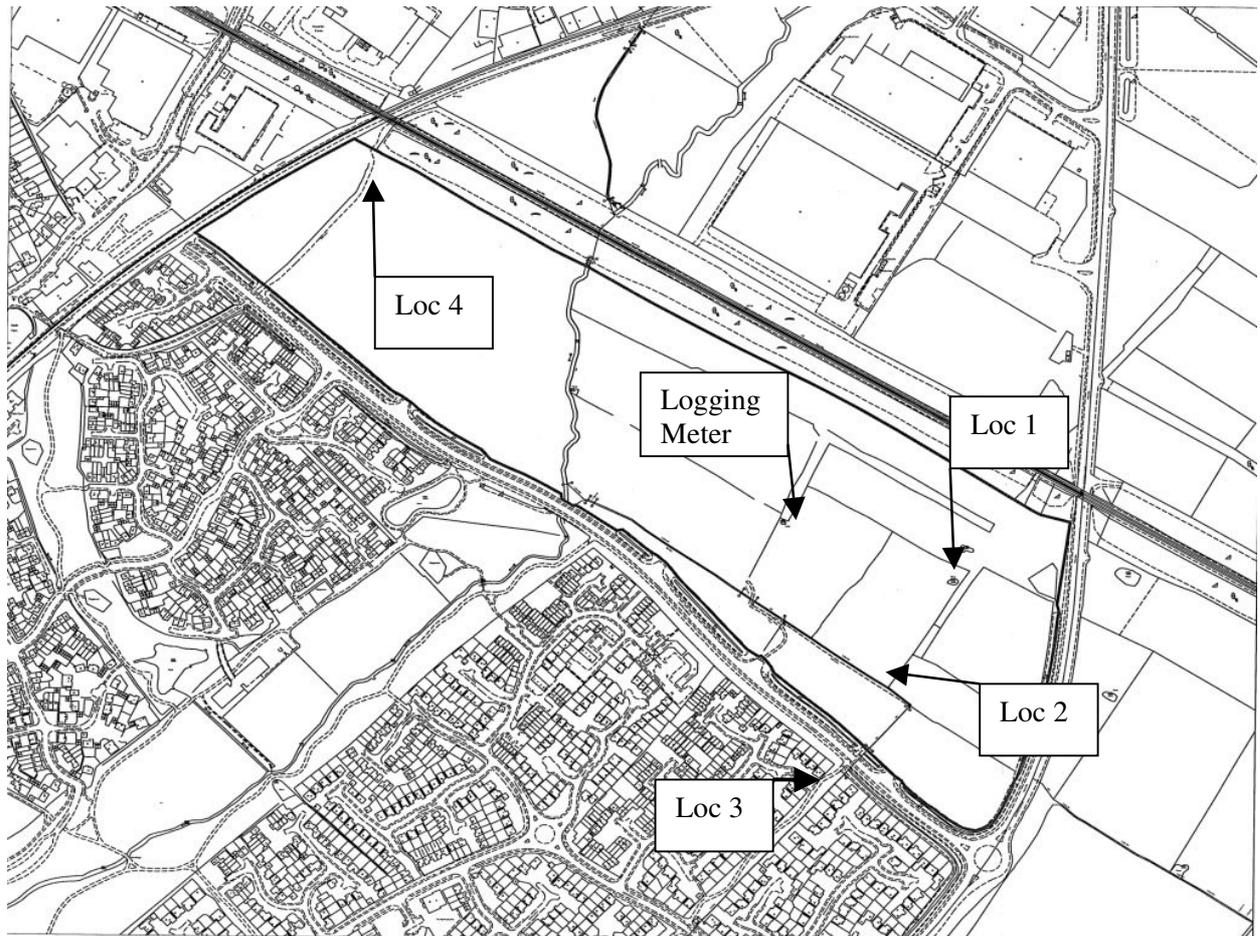


Figure 1 Map showing positions of measurement locations

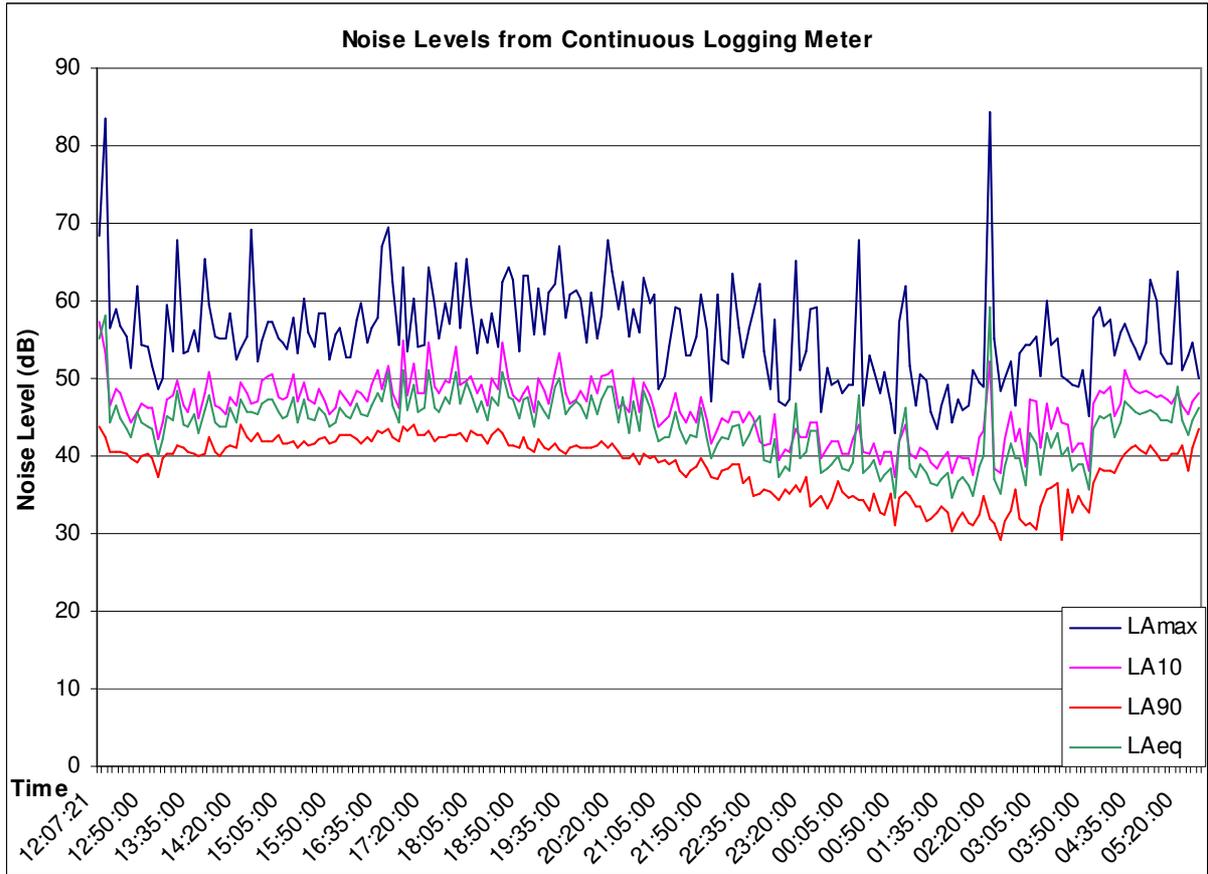


Figure 2 Graph of L_{Amax} , L_{Aeq} , L_{A10} and L_{A90} noise levels measured at the logging meter

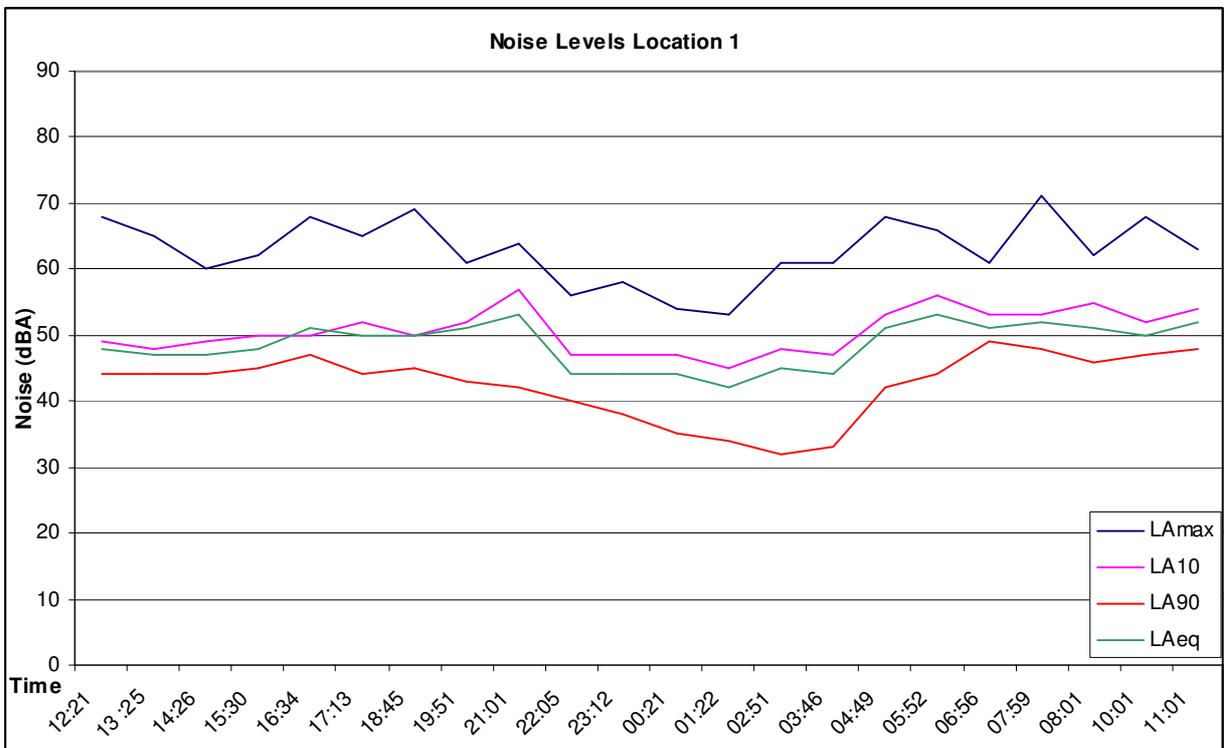


Figure 3 Graph of L_{Amax} , L_{Aeq} , L_{A10} and L_{A90} noise levels measured at location 1

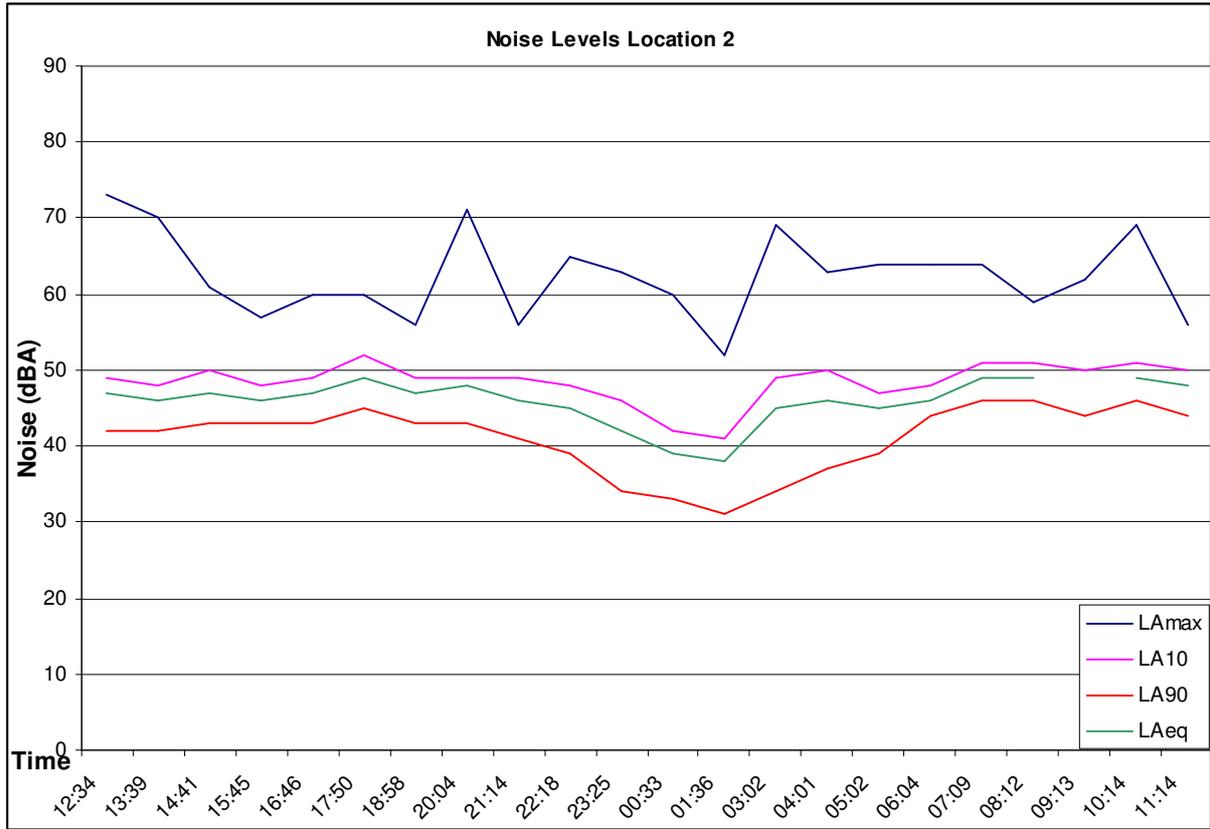


Figure 4 Graph of L_{Amax} L_{Aeq} L_{A10} and L_{A90} noise levels measured at location 2

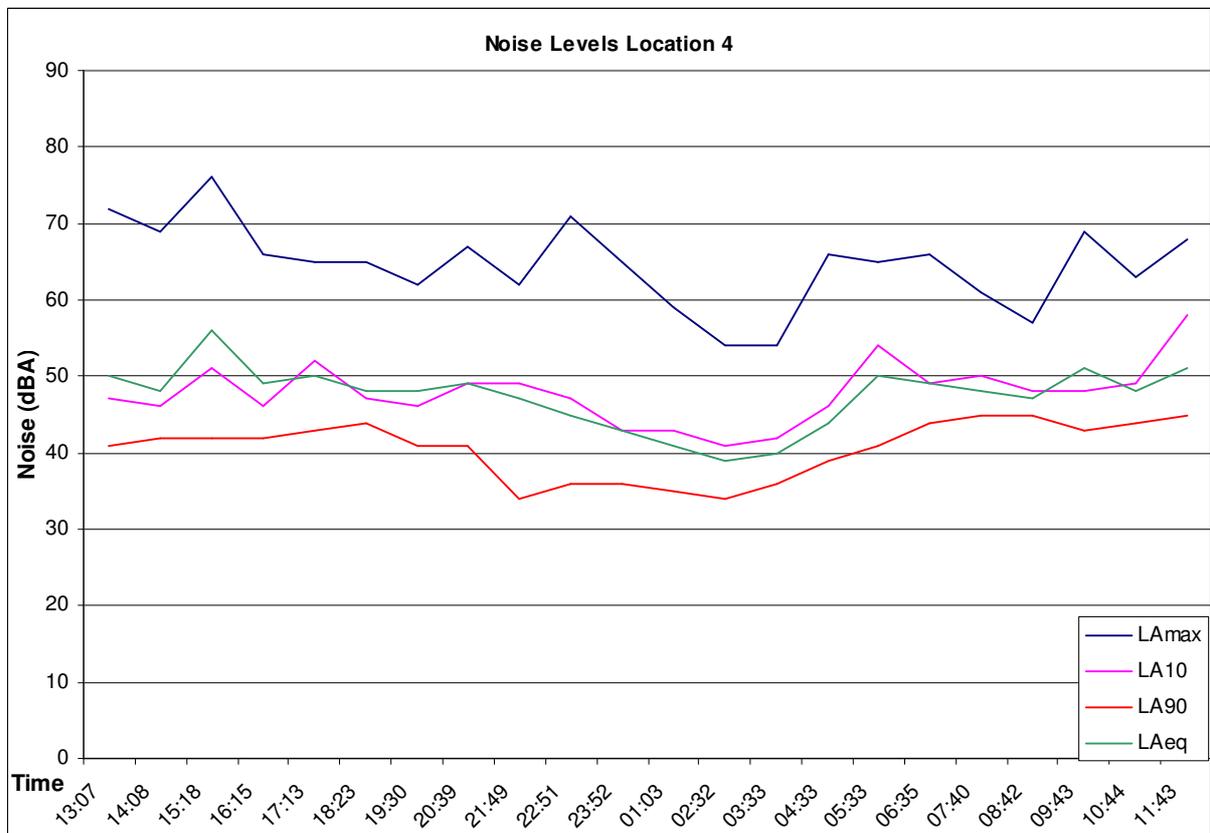


Figure 5 Graph of L_{Amax} L_{Aeq} L_{A10} and L_{A90} noise levels measured at location 3

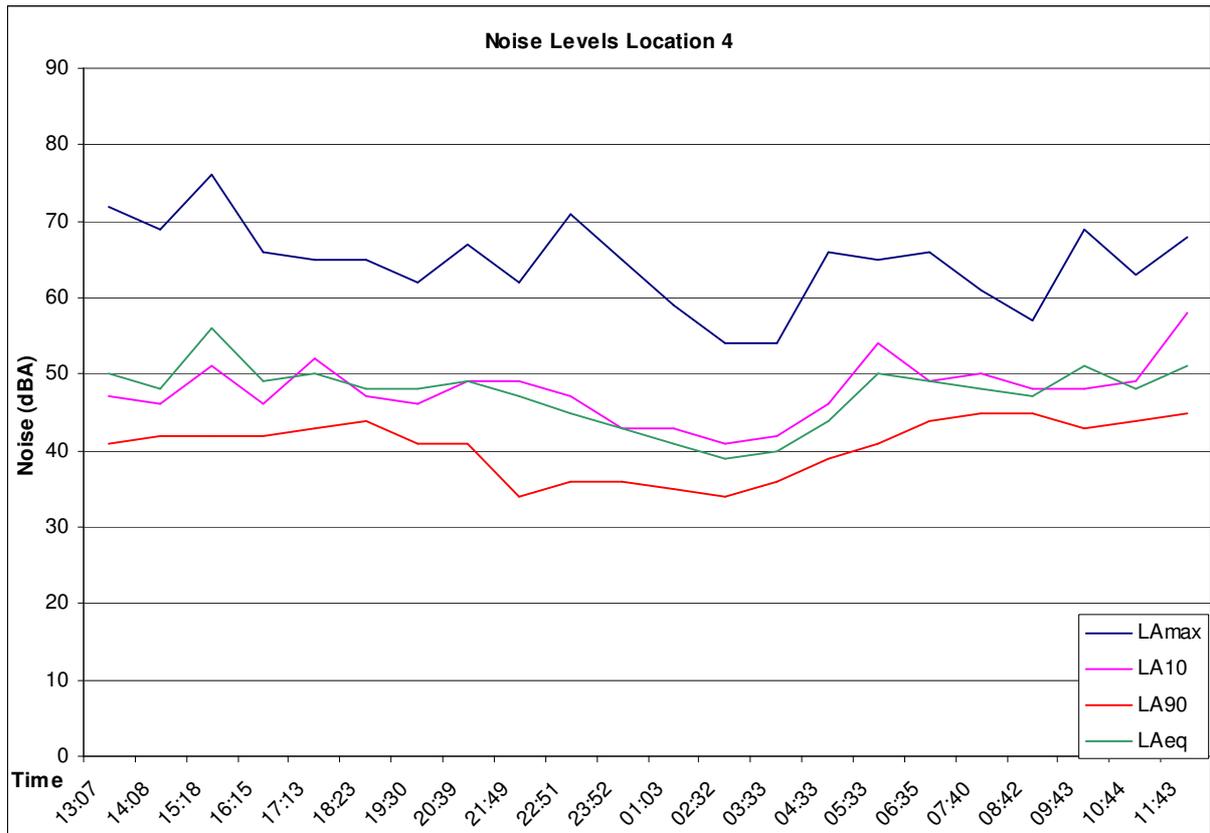


Figure 6 Graph of L_{Amax} L_{Aeq} L_{A10} and L_{A90} noise levels measured at location 4



Figure 7 Daytime NEC zones



Figure 8 **Night time NEC zones**

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APPENDIX A

Results Tables

Date	Time		Wind		Noise Level, dB (A)						Comments
	Start	Finish	Speed (ms ⁻¹)	Direction	L _{min}	L ₉₀	L ₁₀	L ₁	L _{Amax}	L _{eq}	
29.06.04	12:11										
	14:30										I visited meter & checked batteries
	16:35										I checked meter, all OK
	02:17										Visit to check water proofing and raining slightly
	22:15										

Table 2: Logging meter Bicester

Date	Time		Wind		Noise Level, dB (A)						Comments
	Start	Finish	Speed (ms ⁻¹)	Direction	L _{min}	L ₉₀	L ₁₀	L ₁	L _{Amax}	L _{eq}	
29.06.04	12:21		2.4 ave 3.6 max	SW		44	49	58	68	48	Noise from A4421 & wind in trees, regular loud bird song. Children playing to SW, 1 x train, 2 x plane. Distant building noise to S, road noise concentrated to S
	13:25		1.4 ave 1.8 max	W		44	48	52	65	47	As above, but with more road noise from WSW distant. 1 x lorry on Gavray Drive no aircraft or trains
	14:26		2.1 ave 2.6 max	SW		44	49	52	60	47	As above, no lorry
	15:30		1.4 ave 1.9 max	SW		45	50	57	62	48	More noise from A4421 & A41, birds quieter
	16:34		2.1 ave 2.6 max	SW		47	50	62	68	51	A4421 & A41 (40/60), birds and wind in grass, sometimes significant. 1 x train & 50m hammering, 100m to NW. Birds are loudest thing, but intermittent

Date	Time		Wind		Noise Level, dB (A)						Comments
	Start	Finish	Speed (ms ⁻¹)	Direction	L _{min}	L ₉₀	L ₁₀	L ₁	L _{Amax}	L _{eq}	
	17:13	17:33	1.2	SW		44	52	60	65	50	Noise from A41 & A4421, wind in trees, birds, train
	18:45		NS			45	50	63	69	50	A41 & A4421, birds 2 x plane. Hammer 100m toward the depot 1 x train
	19:51		NS			43	52	74	61	51	A41 & A4421, 2 x train (2 max), birds
	21:01		NS			42	57	67	64	53	Birds, train, A4421 (more & more quiet)
	22:05		NS			40	47	50	56	44	A41 & A4421 (more & more quiet)
	23:12		NS			38	47	50	58	44	A41 & A4421 (more & more quiet)
29.06.04	00:21		NA			35	47	51	54	44	Gavray Drive with A41 in background & A4421
	01:22		calm			34	45	51	53	42	A4421 is loudest with A41 in background, rain 2am 2.30
	02:51		calm			32	48	58	61	45	Light rain as above, though industrial noise to North audible when all else quiet, fan?
	03:46		0.6 ave 1.1 max	SW		33	47	54	61	44	Traffic on A4421 is loudest though intermittent, A41 constant background, birds
	04:49		calm			42	53	63	68	51	Bird song constant and dominates, A41 also constant with A4421 intermittently significant
	05:52		calm			44	56	61	66	53	As above, though roads much louder, particularly A4421
	06:56		calm			49	53	55	61	51	Birds/A41 & A4421 intermittent
	07:59		< 1			48	53	58	71	52	A41 & A4421, birds, 2 x planes, 1 x train & 1 x klaxon
	08:01		< 1			46	55	58	62	51	1 x train, 2 x plane, A41 & A4421, birds & road noise
	10:01		2.8	SW		47	52	55	68	50	1 x train, mainly A41 & A4421 intermittent
	11:01		2.1	SW		48	54	58	63	52	Mainly A41, train x 1, wind in trees

Table 3: Location 1 : North end of field as shown on Figure 1

Date	Time		Wind		Noise Level, dB (A)						Comments
	Start	Finish	Speed (ms ⁻¹)	Direction	L _{min}	L ₉₀	L ₁₀	L ₁	L _{Amax}	L _{eq}	
29.06.04	12:34		0.7 0.9	SW		42	49	53	73	47	Main noise source from road to South & occasion cars on Gavray Drive. Clanging from building site? To SW 200m? lots of birdsong 50m noise from wind in grass, occasional motorcycle noise from west
	13:39		calm			42	48	52	70	46	As above, 1 x train & horn
	14:41		0.7 1.1	SW		43	50	53	61	47	1 x aircraft & noise from south. A41 & children playing in distance also some noise from Gavray Drive & scaffolding
	15:45		0.7 ave 0.9 max	SW		43	48	51	57	46	Noise from A41, some from town to west & a little from Gavray Drive. Birds quieter, though still present. Some wind in trees
	16:46	16:53	0.7 ave 1.3 max	S		43	49	52	60	47	1 x train, noise from south mainly from A41 though some from A4421 & occasional car on Gavray Drive. A few birds, occasional hammering
	17:50			NS		45	52	54	60	49	Noise from A41 & A4421, few birds, aircraft. Train (E-W) & W-E
	18:58			NS		43	49	53	56	47	A41 & A4421, birds, 1 x plane
	20:04					43	49	54	71	48	A41 & A4421, birds 1 x train
	21:14					41	49	52	56	46	Background noise from South, birds 1 x train
	22:18			NS		39	48	53	65	45	A41 & A4421, strange animal barking, 1 x plane
	23:25					34	46	50	63	42	A41, 2 x train
	00:33		calm			33	42	46	60	39	A41, very distant alarm to west Gavray Drive & A4421, occasional distant shout
	01:36		calm			31	41	46	52	38	As above, no alarm, rain 2:00-2:30

Date	Time		Wind		Noise Level, dB (A)						Comments
	Start	Finish	Speed (ms ⁻¹)	Direction	L _{min}	L ₉₀	L ₁₀	L ₁	L _{Amax}	L _{eq}	
	03:02		calm			34	49	55	69	45	As above though 2 very loud HGV's on A4421. Birds, restarted clock relatively quiet at present
	04:01		calm			37	50	55	63	46	Bird song dominates A41 in background occasionally A4421
	05:02		calm			39	47	50	64	45	As above, with some noise from West A41?
	06:04		calm			44	48	50	64	46	As above, roads noisier than before, 50/50 with birds
	07:09		calm			46	51	53	64	49	As above, but road noise noisier than birds, train x 1
	08:12		< 1			46	51	55	59	49	Helicopter x 1, plane x 1, train x 1 A41/A4421
	09:13		< 1			44	50	54	62		Train x 1, plane x 1, A41 & A4421
	10:14		NS			46	51	53	69	49	A41 & A4421, plane x 1
	11:14		NS			44	50		56	48	Train x 1

Table 4: Location 2 Southern corner of field as shown on Figure 1

Date	Time		Wind		Noise Level, dB (A)						Comments
	Start	Finish	Speed (ms ⁻¹)	Direction	L _{min}	L ₉₀	L ₁₀	L ₁	L _{Amax}	L _{eq}	
	12:49		1.3 ave 2.0 max	SW		40	50	60	68	49	Noise from scaffold poles to SE 100m, background from birds & A4124 & A41
	13:51		1.1 ave 1.4 max	S		39	50	60	76*	49	As above & 2 people talked as passed by*
	14:59		2.0 ave 2.7 max	S							As above, no scaffold noise, with lawn mower going roughly 40% of time, no people talking, traffic on Gavray Drive, 5 x cars & 1 x van
	15:57		calm			44	51	60	*83	55	A4421 mow loudest, with A41 (50/50) birds still pretty constant & some noise from gardening 20m away, 2 x cars & 1 x van. *dog barking 10m away
	16:56		1.8 2.2	WSW		43	55	62	*73	53	2 x aircraft, 1 high 1 low – helicopter, 6 x cars, 2 x vans* Background noise as above with music form nearby house (?) & wind in trees
	18:04			NS		45	56	68	78	56	Cars on Gavray Drive x 16, A41, A4421, Aircraft
	19:12			NS		42	53	61	67	50	Cars on Gavray Drive x 11, A41, A4421, gardening motor engine close
	20:19	20:27		NS		38	47	65	58	46	Cars on Gavray Drive x 5, 1 x plane, A41 & A4421, stopped before because battery is low and calm
	21:28			NS		38	48	58	64	47	A41 & A4421
	22:33			NS		35	45	54	63	43	A41 & A4421, people talking in Gavray Drive
	23 :40			NS			43	55	64	42	A41 & A4421, people talking on Gavray Drive, 3 x cars in Gavray Street
	00:45			calm			40	45	52	37	A41, A4421 occasional traffic on Gavray Drive, 1 x train
	1 :49			calm			38	47	58	37	As above, started to rain, 2 am – 2.30 am
	03:16			calm		31	43	51	55	40	As above, birds occasionally, not yet significant
	04:15			calm		34	42	47	53	39	Birdsong loudest but intermittent, A41 & A4421 (70/30) Background, light rain
	05:15			calm		38	52	58	66	48	As above

Date	Time		Wind		Noise Level, dB (A)						Comments
	Start	Finish	Speed (ms ⁻¹)	Direction	L _{min}	L ₉₀	L ₁₀	L ₁	L _{Amax}	L _{eq}	
	06:16			calm		44	47	53	68	46	As above
	07:22			calm		45	51	58	65	43	As above, it is raining a bit
	08:25					45	53	60	66	50	Mainly A41, 11 x cars on Gavray Drive. It's raining again
	9:26			NS		46	52	58	65	50	A41, 13 x cars on Gavray Drive
	10:27			NS		46	52	59	69	50	1 x aircraft, A41, 5 x cars on Gavray Drive
	11:27		1.5	W		46	52	59	66	50	A41, 8 x cars on Gavray Drive, grass cutting 2 houses closer

Table 5: Location 3 on walk way between Gavray Drive 4

Date	Time		Wind		Noise Level, dB (A)					Comments	
	Start	Finish	Speed (ms ⁻¹)	Direction	L _{min}	L ₉₀	L ₁₀	L ₁	L _{Amax}		L _{eq}
	13:07	13:14	calm			41	47	64	*72	50	Noise from town cars etc & possible trains shunting to west. *person asking what I am doing. Bird song loudest with road noise from west in background. Some noise from children 300m? to SW 1 x train & horn on East west line
	14:08		2.0 ave 2.4 max	SW		42	46	59	69	48	Bird song & road noise from SW is loudest, some road noise from A4421 & A41 and from wind in trees, occasional loud noise from SW (clunking-train shunting?) and a quiet whistle from South, almost constant but very quiet
	15:18	15:24	calm			42	51	72	*76	56	As above, *2 x trains and horn, 1 x plane
	16:15		1.2 ave 1.6 max	SW		42	46	62	66	49	Background from road noise to E & S (60/40) with birds, 1 x train accelerating so very noisy
	17:13		2.6 max 3.8 max	S		43	52	62	65	50	Noise from road to south and industrial road noise from west. Car horns to SW & 2 x aircraft. Some bird noise, 1 x train, children talking 20m
	18:23			NS		44	47	62	65	48	A41/A4421 noise from birds, 2 x plane, 1 x train. People are talking @ 50m
	19:30			NS		41	46	60	62	48	1 x train, birds, road noise from South (industrial) people are talking
	20:39					41	49	62	67	49	A lot of people on the point, I stand 100m from the point, noise from South and small motorbike, people are talking
	21:49					34	49	57	62	47	Still a lot of people, noisier, stopped because too much noise from people
	22:51					36	47	56	71	45	Still some people and road A41
	23:52					36	43	52	65	43	Still some children, road noise
	01:03		calm			35	43	44	59	41	As above, rain 2 am -2.30 am
	02:32		calm			34	41	45	54	39	Very light rain, 2 x cars in Gavray Drive, otherwise as above. A41 dominant, A4421 significant, children still there
	03:33	03:38	1.2 ave 2.3 max	SW		36	42	49	*54	40	As above, birds now much louder, *children passing, stopped due to children not moving away
	04:33		calm			39	46	51	66	44	Bird song loudest. A41 & road to west is background, some noise from children 100m to north

Date	Time		Wind		Noise Level, dB (A)						Comments
	Start	Finish	Speed (ms ⁻¹)	Direction	L _{min}	L ₉₀	L ₁₀	L ₁	L _{Amax}	L _{eq}	
	05:33		0.7 ave 1.0 max	SW		41	54	59	65	50	As above, just caught the tail end of freight train, children pretty much quiet, birdsong almost constant
	06:35					44	49	62	66	49	A41 & birds, 1 x aircraft, children are waking up, 3 x planes, children quiet
	07:40		calm			45	50	54	61	48	Road noise, birds, 3 x planes, children quiet
	08:42					45	48	53	57	47	Road, birds 1 x plane
	9:43		2.5	W		43	48	66	69	51	No children, road noise, industrial from W-SW, 1 x train
	10:44		2.0	W		44	49	60	63	48	1 x train, road noise from W-SW
	11:43		2.4	W		45	58	63	68	51	Road noise from W-SW, 2 x aircraft, 1 x train, 2 x helicopter

Table 6: Location 4 on footpath at NW end of site

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APPENDIX B

**Environmental
Terminology**

ENVIRONMENTAL TERMINOLOGY

dB(A)

The unit generally used for measuring environmental, traffic or industrial noise is the A-weighted sound pressure level in decibels, denoted dB(A). An A-weighting network can be built into a sound level measuring instrument such that sound levels in dB(A) can be read directly from a meter. The weighting is based on the frequency response of the human ear and has been found to correlate well with human subjective reactions to various sounds. It is worth noting that an increase or decrease of approximately 10 dB corresponds to a subjective doubling or halving of the loudness of a noise, and a change of 2 to 3 dB is subjectively barely perceptible.

EQUIVALENT CONTINUOUS SOUND LEVEL

Another index for assessment for overall noise exposure is the equivalent continuous sound level, L_{eq} . This is a notional steady level which would, over a given period of time, deliver the same sound energy as the actual time-varying sound over the same period. Hence fluctuating levels can be described in terms of a single figure level.

STATISTICAL NOISE LEVELS

For levels of noise that vary widely with time, for example road traffic noise, it is necessary to employ an index which allows for this variation. The L_{10} , the level exceeded for ten per cent of the time period under consideration, has been adopted in this country for the assessment of road traffic noise. The L_{90} , the level exceeded for ninety per cent of the time, has been adopted to represent the background noise level. The L_1 , the level exceeded for one per cent of the time, is representative of the maximum levels recorded during the sample period. A weighted statistical noise levels are denoted L_{A10} , dB_{LA90} etc. The reference time period (T) is normally included, e.g. $dB_{LA10, 5 \text{ min}}$ or $dB_{LA90, 8 \text{ hr}}$.